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THE WAY TO GO

Driving the Transformation

A Briefing on Oregon's Electric Vehicle Initiative

2010 Beaverton Neighborhood Summit, Living Greener

April 10, 2010

Session outline

- Why electric vehicles ... and why now?
- Key pieces of the puzzle
  - Charging infrastructure
  - Electric vehicles
  - Consumer awareness and willingness
- Getting ready in your community
- To learn more
- Questions and answers

Why electric vehicles and why now?

- The simple answer is that gas powered internal combustion engine transportation appears to be a poor play in the long term. Consider ...
- Oil provides 40% of America's primary energy needs
- U.S. transportation sector consumes nearly 14M barrels of petro daily
- Our cars, trucks, planes and ships rely on oil for 94% of their fuel
- In 2008, the U.S. spent $900 billion on gasoline, diesel, and other petro products; much of which exited our economy
- Every day more than half of the world's oil supplies must transit one of six maritime choke points (like the Gulf of Hormuz, Suez Canal) causing the U.S. to expend enormous military resources patrolling these channels from hostile forces and possible shutdown.

Why electric vehicles and why now?

- Rising demand for oil (China, India, Vietnam) = rising competition for oil
- Peak oil: The moment in time when the maximum rate of global petroleum extraction is reached, after which the rate of production enter terminal decline. Estimates vary, but some experts believe we will reach this point between 2015-2020, and that extraction of available petroleum will be harder (and more expensive) at the very time competition for the resource is mounting.
- The environmental argument: internal combustion engines produce carbon dioxide tailpipe emissions that contribute to the global build-up of greenhouse gas -- a major contributor to climate change

Why electric vehicles and why now?

Carbon Calculations

Example	Model Year	Make & Model	Miles/Year	C02/Year (lbs.)
1	2003	Ford F-150 Pick Up 2WD	15,000	22,574
2	2005	Honda Accord	20,000	16,303
3	2009	BMW 3-Series	12,000	10,200
4	2007	Mini Cooper	15,000	9,782
5	1997	Toyota Camry	7,500	7,114
6	2004	Chevy Suburban SUV	10,000	13,043
		SUBTOTALS	79,500	79,016
		AVERAGE	13250	13169.33

Why electric vehicles and why now?

Carbon Calculations

- (Generic) Business Truck/Van driven 18,000 miles/year = 46,860 lbs. of CO_2
- Registered motor vehicles in Oregon (2003) = 3,060,786
- Lot's of petroleum dependence and CO_2 tailpipe emissions just from a relatively small state like Oregon!

Why electric vehicles and why now?

The case for electrification

- Electricity is diverse and domestic
- Electricity prices are stable
- The power sector has spare capacity
- The network of infrastructure already exists
- “Electric miles” are cheaper than “gasoline miles”
- “Electric miles” are cleaner than “gasoline miles” (Oregon’s portfolio of hydro generation and growing mix of renewable energy underscores this proposition)

Bottom Line

- Over reliance on petroleum poses a long-term threat to our nation’s economy, environment, and security.
- Migrating to EVs enhances energy security
- Migrating to EVs can significantly stem the hemorrhage of dollars from our economy
- Migrating to EVs reduces carbon dioxide emissions

Key pieces of the E.V. puzzle

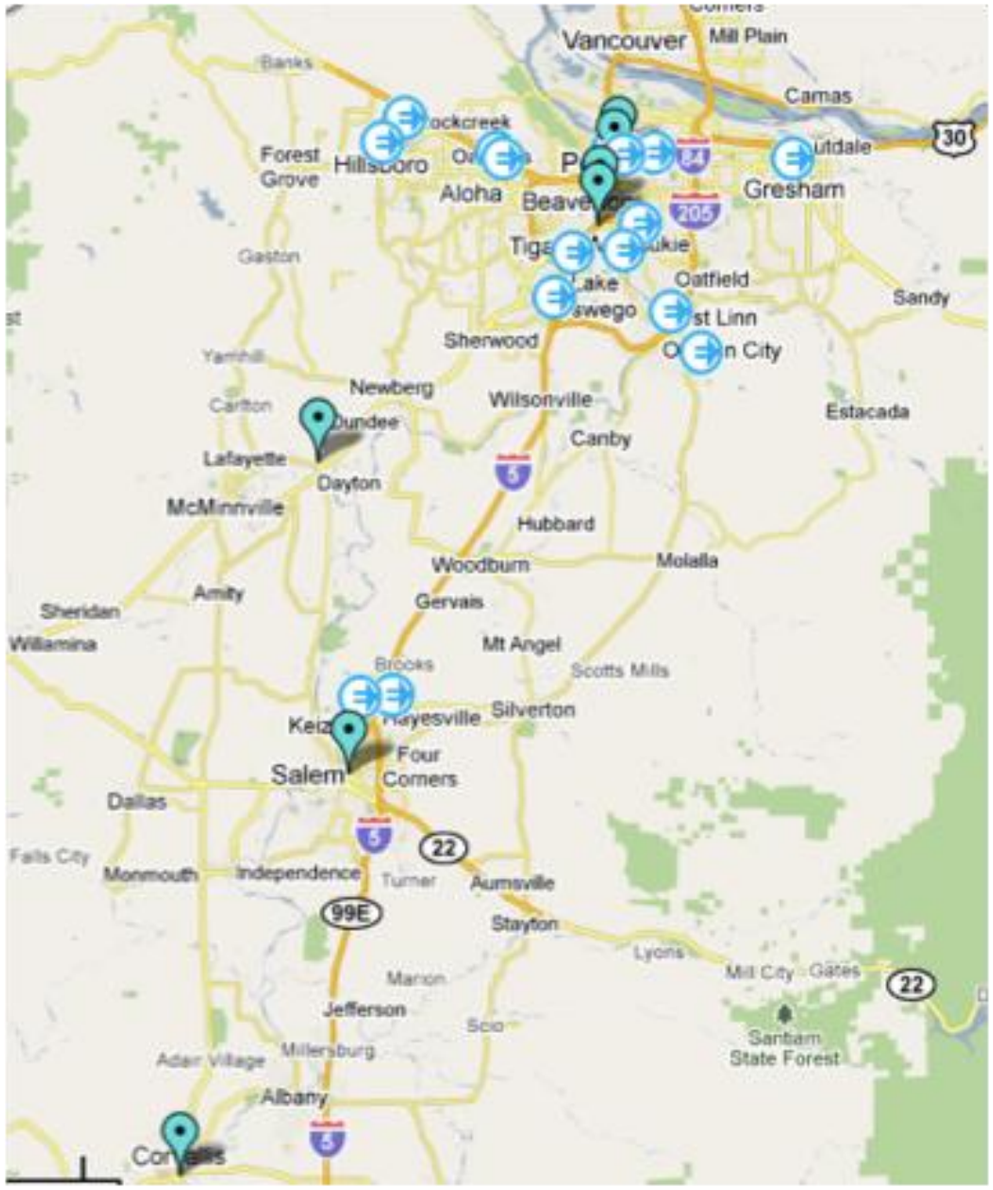
Three key factors must come together to support the transition

- Charging infrastructure
- Electric vehicles
- Consumer awareness and willingness

Charging infrastructure
The

Oregon’s existing network

- Over 25 charging stations installed
- Mostly owned by local businesses
- Common logo/color markings
- Powered by renewable energy



Charging infrastructure

The

(Existing charging stations sorted by City)

SITE	CITY	STATUS
Nike - Shorepower	Beaverton	Private
Kaiser Sunnyside	Clackamas	Private
Clackamas County - Shorepower	Clackamas County	Public
City of Corvallis - Elements Building	Corvallis	Public
Stoller Vineyards & Winery	Dayton	Private
Arcimoto Electric Vehicles	Eugene	Planned
City of Gresham City Hall - Shorepower	Gresham	Public
Hillsboro Civic Center	Hillsboro	Public
Intel - Jones Farm Campus - Shorepower	Hillsboro	Planned
City of Lake Oswego - Shorepower	Lake Oswego	Public
Shorenstein Realty - Shorepower	Lake Oswego	Public
City of Milwaukie - Shorepower	Milwaukie	Public
City of Oregon City - Shorepower	Oregon City	Public
City of Portland - Shorepower	Portland	Public

Charging infrastructure

The

(Existing charging stations sorted by City)

SITE	CITY	STATUS
Fred Meyer Hawthorne Blvd - Shorepower	Portland	Planned
Hillsdale Library	Portland	Public
Old Town Smart Park	Portland	Public
Oregon Museum of Science and Industry (OMSI)	Portland	Public
PGE - World Trade Center City Parking - Shorepower	Portland	Public
Shaver Green Building - Shorepower	Portland	Private
Smart Park	Portland	Public - call ahead
West Hills Carstar Collision	Portland	Public - call ahead
World Trade Center Parking Garage	Portland	Public
Keizer - Shorepower	Salem	Planned
Oregon Department of Energy	Salem	Public
PGE Salem Office - Shorepower	Salem	Public
PGE Tualatin Contact Center - Shorepower	Tualatin	Public - call ahead
Pheasant Ridge RV Park	Wilsonville	Public - call ahead

Charging infrastructure

Types of E.V. charging units

LEVEL I

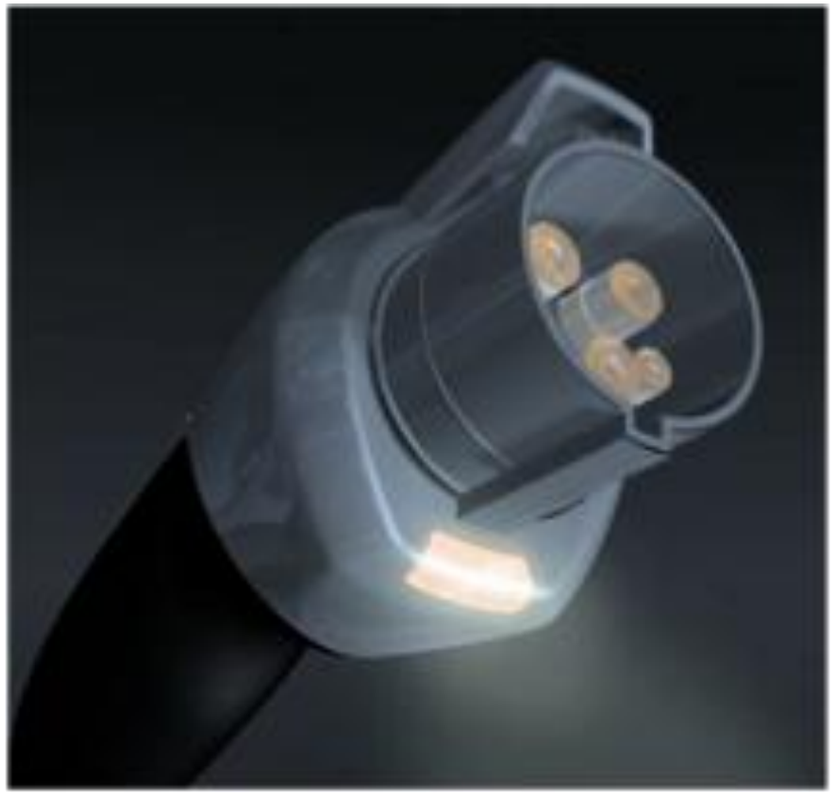
- Standard 120 volt outlet
- Up to 20 amps
- Will upgrade to Level II by summer 2010

Charging infrastructure

Types of E.V. charging units

LEVEL II

- 208/240 volt outlet
- Up to 80 amps, but 50 amps typical
- Standard SAE J1772 connector
- Homes, public facilities, retail, employees



Charging infrastructure

Types of E.V. charging units

LEVEL III

- Quick charge - 30 minutes or less
- 480 volt 3 phase power source, 50 MW
- DC voltage to vehicles
- Special connector
- For placement in strategic locations

EV charging metrics/performance

Level	Input Voltage	Typical Charging Time	Breaker Size (A)	Electrical Loads (kW)	Typical Locations
I	120 V	8 – 12 hours	15-20	2	Standard 120 volt plug; NEV/ Motorcycle charging, Emergency charging
II	240 V	2 – 4 hours	30-50 Typical	3-6	Residential garages, parking lots, public garages, transit centers
III	480 V 3 phase	20 – 40 minutes		50-100	Rapid charging facility near high traffic volume arterials

Charging Infrastructure

The E.V. Project

- Oregon selected as one of 5 electric vehicle test markets under a federal grant to eTec and its partner, Nissan North America
- Other markets include Seattle, San Diego, Phoenix-Tucson, and Nashville, Knoxville, and Chattanoga
- The charging network in Oregon will begin to grow dramatically this summer in the Eugene-Corvallis-Salem-Portland region
- Most are level II charging units; a few level III units
- An estimated 900 charging stations will be installed and ready for use in Oregon by December 2010, when the zero-emission, all-electric Nissan Leaf goes on sale.

Charging Infrastructure

The E.V. Project

- Goals of the E.V. Project
  - Collect and analyze data to characterize vehicle use in diverse topographic and climatic conditions,
  - Evaluate the effectiveness of charge infrastructure
  - Conduct trials of various revenue systems for commercial and public charge infrastructure.
  - The ultimate goal of The EV Project is to take the lessons learned from the deployment of these first 4,700 EVs, and the charging infrastructure supporting them, to enable the streamlined deployment of the next 5,000,000 EVs.

Charging Infrastructure

West Coast Green Highway Initiative

- Installing Level III charging “waypoints” along I-5 corridor
- Federal DOT and BC-WA-OR-CA DOTs
- OR-WA-BC MOC
- Agreement in concept to initially link Eugene-Portland
- Then north to Puget Sound
- And on to Vancouver, B.C.
- 450 miles long with10M population base
- Similar demographic and sustainability values
- To allow residents of one metro area to travel to other metro areas using EVs

Electric Vehicles

Battery electric vehicles

- Typically about 100 mile range
- Charge in about 8-hours on a Level II charger
- Zero tailpipe emissions
- Coming to Oregon later this year: Nissan Leaf, Mitsubishi iMiev, Ford Focus, Smart EV, Think!

Electric Vehicles

Plug-in hybrids

Example: Toyota Plug-in Prius

- Typically about 10-15 mile range in battery-only mode
- Then, cuts over to hybrid operation
- Demo project in Portland starting in June

Electric Vehicles

Extended range EVs

Example: Chevy Volt

- Typically about 40-mile range in battery-only mode
- Then, engages an internal combustion engine to generate additional power for the motor
- Coming to Oregon by Q2 2011

Electric Vehicles

Light-duty urban freight EVs

Electric Vehicles

Neighborhood electric vehicles (EVs)

Electric Vehicles

Recreational vehicles

Electric Vehicles

Personal mobility EVs

Vehicles

Comparing EVs and gas-powered vehicles

	THE GASOLINE VS. ELECTRIC CAR
	COST PER MILE COMPARISON
1	unit = one gallon of gas
$3.00	price - one gallon gas (US)
30	miles per gallon - gasoline car
$0.10	cost per mile - gas car
25%	efficiency - gas to mechanical energy
120	miles per gallon - 100% efficiency
80%	efficiency - grid to battery to electric motor
96	miles per gallon - electric car
33	kilowatt-hours energy stored in one gallon gas
2.9	miles per kilowatt hour - electric car
$0.10	cost per kilowatt hour
$0.03	cost per mile - electric car

Consumer awareness

Recent public opinion research in Oregon

- 61% believe EVs are immediately available to purchase by the general public in Oregon, but are unsure which EV companies are selling what EV products where.
- 84% have some degree of knowledge about EVs, with 38% who say they are at least “somewhat knowledgeable,” representing an opportunity to educate residents.
- 62% think charging stations should be made more readily available before EVs are manufactured in high volume.

Consumer awareness

Recent public opinion research in Oregon

- 75% report they would have a higher impression of a company that uses EVs to distribute its products and conduct its business within the city.
- 88% believe it is important for the United States to be a leader in using EVs as an alternative to gasoline fueled vehicles.

Ultimately, it’s a choice

- We typically have three options whenever we face a new technology:
  - Promote it (or actively adapt)
  - Resist it
  - Ignore it
- Migrating to EVs is a choice
- Are you prepared to make the move yourself? Are you prepared to promote the transition where you live and work?

“Innovation distinguishes between a leader and a follower”

Apple CEO Steve Jobs

Ready, set, go ... by EV!

Getting E.V. ready in your community

- Purchasing commitments from corporate/city/state fleets
- Support infrastructure development – *location, location, location*
- Fast-track permitting and inspections for charging stations
- New building codes to support plug-in vehicles

Ready, set, go ... by EV!

Getting EV-ready in your community

- Offer incentives (home charger vouchers, rebates, etc.)
- Create perks (free parking, access to HOV lanes, etc.)
- Educate consumers and citizens (call our speakers bureau

Ready, set, go ... by EV!

Some resources for getting yourself ready

- Check out Oregon's electric vehicle website www.EVRoadMap.com
- Follow progress and key developments of the U.S. Department of Energy-eTec-Nissan charging infrastructure effort, *The E.V. Project* at www.theevproject.com/
- Download *The Electrification Roadmap* from www.electrificationcoalition.org
- Review the recently completed Final Report of the Governor's Alternative Fuel Infrastructure Working Group at http://governor.oregon.go/Gov/pdf/afviwg_final_report.pdf

Contact Information

Let us know if, when, and how we can help

- (Presenter's name)
- Affiliation
- Telephone
- Email

Questions, answers, comments